

We claim:

1. An isolated polypeptide comprising a subunit of chlorotoxin or a related scorpion toxin, wherein the polypeptide specifically binds to a cancer cell.

5

2. The isolated polypeptide of claim 1 wherein the polypeptide comprises an amino acid sequence selected from the group consisting of SEQ ID NO: 6, 7, 8, 9, 10, 11, 12, 13 and 14.

10 3. The isolated polypeptide of claim 1 wherein the polypeptide comprises the amino acid sequence

TTX₁X₂X₃MX₄X₅K (SEQ ID NO: 13), wherein

(a) X₁ is an acidic amino acid selected from the group consisting of aspartic acid and glutamic acid;

15 (b) X₂ is an amino acid selected from the group consisting of alanine, arginine, asparagine, aspartic acid, cysteine, glutamine, glutamic acid, glycine, histidine, isoleucine, leucine, lysine, proline, methionine, phenylalanine, serine, threonine, tryptophan, tyrosine and valine;

(c) X₃ is an amide amino acid selected from the group consisting of asparagine and glutamine;

20 (d) X₄ is an amino acid selected from the group consisting of serine, threonine and alanine; and

(e) X₅ is a basic amino acid selected from the group consisting of histidine, lysine and arginine.

25 4. The isolated polypeptide of claim 3 wherein the amino acid sequence is SEQ ID NO: 14 (TTDHQMARK).

5. The isolated polypeptide of claim 3 wherein the amino acid sequence is SEQ ID NO: 94 (TTDQQQMTKK).

30

6. The isolated polypeptide of claim 3 wherein in the amino acid sequence is SEQ ID NO: 95 (TTDPQMSKK).

35 7. The isolated polypeptide of claim 1 wherein the cancer cell is from a cancer selected from the group consisting of lung cancer, bone cancer, liver cancer, pancreatic cancer, skin

cancer, cancer of the head or neck, cutaneous or intraocular melanoma, uterine cancer, ovarian cancer, rectal cancer, cancer of the anal region, stomach cancer, colon cancer, breast cancer, uterine cancer, carcinoma of the fallopian tubes, carcinoma of the endometrium, carcinoma of the cervix, carcinoma of the vagina, carcinoma of the vulva, Hodgkin's Disease, cancer of the 5 esophagus, cancer of the small intestine, cancer of the endocrine system, cancer of the thyroid gland, cancer of the parathyroid gland, cancer of the adrenal gland, sarcoma of soft tissue, cancer of the urethra, cancer of the penis, prostate cancer, chronic or acute leukemia, lymphocytic lymphomas, cancer of the bladder, cancer of the kidney or ureter, renal cell carcinoma, carcinoma of the renal pelvis, neoplasms of the central nervous system (CNS), neuroectodermal 10 cancer, spinal axis tumors, glioma, meningioma and pituitary adenoma.

8. A fusion polypeptide comprising the polypeptide of claim 1 linked to a second polypeptide.
- 15 9. The fusion polypeptide of claim 8 wherein the second polypeptide comprises a cancer cell-binding domain which binds specifically of an epitope expressed only by a cancer cell.
10. The fusion polypeptide of claim 9 wherein the second polypeptide is an antibody or fragment thereof.
- 20 11. The fusion polypeptide of claim 8 wherein the second polypeptide comprises a stabilization domain which prevent degradation of the fusion polypeptide.
12. The fusion polypeptide of claim 8 wherein the second polypeptide is selected from the group consisting of polyhistidine, human serum albumin and human transferrin.
- 25 13. The polypeptide of claim 1 wherein the polypeptide is linked to a cytotoxic agent.
14. The polypeptide of claim 13 wherein the cytotoxic agent is selected from the group 30 consisting of gelonin, ricin, saponin, pseudomonas exotoxin, pokeweed antiviral protein, diphtheria toxin and complement proteins.
15. The polypeptide of claim 1 wherein the polypeptide is labeled.

16. The polypeptide of claim 15 wherein the label is ^{131}I .

17. A composition comprising the polypeptide of any one of claims 1 to 16.

5 18. A method of treating a disease characterized by abnormal cell proliferation in a mammal comprising administering the composition of claim 17.

19. The method of claim 18, wherein the disease is cancer.

10 20. The method of claim 19 wherein the cancer is selected from the group consisting of lung cancer, bone cancer, liver cancer, pancreatic cancer, skin cancer, cancer of the head or neck, cutaneous or intraocular melanoma, uterine cancer, ovarian cancer, rectal cancer, cancer of the anal region, stomach cancer, colon cancer, breast cancer, uterine cancer, carcinoma of the fallopian tubes, carcinoma of the endometrium, carcinoma of the cervix, carcinoma of the vagina, carcinoma of the vulva, Hodgkin's Disease, cancer of the esophagus, cancer of the small intestine, cancer of the endocrine system, cancer of the thyroid gland, cancer of the parathyroid gland, cancer of the adrenal gland, sarcoma of soft tissue, cancer of the urethra, cancer of the penis, prostate cancer, chronic or acute leukemia, lymphocytic lymphomas, cancer of the bladder, cancer of the kidney or ureter, renal cell carcinoma, carcinoma of the renal pelvis, neoplasms of the central nervous system (CNS), neuroectodermal cancer, spinal axis tumors, glioma, meningioma and pituitary adenoma.

15 21. A method of treating a disease in a mammal characterized by abnormal cell proliferation comprising administering a composition consisting essentially of chlorotoxin or a related scorpion toxin.

20 22. The method of claim 21 wherein the composition is suitable for use in humans.

25 23. The method of claim 21 wherein the amount of chlorotoxin administered is less than about 0.1 mg/kg body weight.

30 24. The method of claim 21 wherein the amount of chlorotoxin administered is less than about 0.05 mg/kg body weight.

25. The method of claim 21 wherein the amount of chlorotoxin administered comprises between about 0.01 µg/kg body weight to about 0.1 mg/kg body weight.

26. The method of claim 21 wherein the amount of chlorotoxin administered comprises
5 between about 0.1 µg/kg body weight to about 0.05 mg/kg body weight.

27. The method of claim 21 wherein the amount of chlorotoxin administered comprises between about 0.1 µg/kg body weight to about 0.1 mg/kg body weight.

10 28. The method of claim 21 wherein the amount of chlorotoxin administered comprises between about 0.1 µg/kg body weight to about 1.0 mg/kg body weight.

29. The method of claim 21 wherein the amount of chlorotoxin administered comprises between about 0.1 µg/kg body weight to about 2.0 mg/kg body weight.

15 30. The method of claim 21 wherein the mammal is a human.

31. The method of claim 21 wherein the disease is cancer.

20 32. The method of claim 31 wherein the cancer is selected from the group consisting of lung cancer, bone cancer, liver cancer, pancreatic cancer, skin cancer, cancer of the head or neck, cutaneous or intraocular melanoma, uterine cancer, ovarian cancer, rectal cancer, cancer of the anal region, stomach cancer, colon cancer, breast cancer, uterine cancer, carcinoma of the fallopian tubes, carcinoma of the endometrium, carcinoma of the cervix, carcinoma of the vagina, carcinoma of the vulva, Hodgkin's Disease, cancer of the esophagus, cancer of the small intestine, cancer of the endocrine system, cancer of the thyroid gland, cancer of the parathyroid gland, cancer of the adrenal gland, sarcoma of soft tissue, cancer of the urethra, cancer of the penis, prostate cancer, chronic or acute leukemia, lymphocytic lymphomas, cancer of the bladder, cancer of the kidney or ureter, renal cell carcinoma, carcinoma of the renal pelvis, neoplasms of the central nervous system (CNS), neuroectodermal cancer, spinal axis tumors, glioma, meningioma and pituitary adenoma.

30 33. An isolated nucleic acid molecule encoding the polypeptide of claim 1.

34. The isolated nucleic acid molecule of claim 33 wherein the nucleic acid molecule is operably linked to one or more expression control elements.

35. A vector comprising an isolated nucleic acid molecule of claim 34.

5

36. A host cell comprising the vector of claim 35.

37. The host cell of claim 36 wherein the host is selected from the group consisting of prokaryotic host cells and eukaryotic host cells.

10

38. A method for producing a polypeptide comprising culturing the host cell of claim 37 under conditions in which the polypeptide encoded by said nucleic acid molecule is expressed.

39. The method of claim 38 wherein the host cell is selected from the group consisting of prokaryotic host cells and eukaryotic host cells.

15
40. An isolated polypeptide produced by the method of claim 39.

20
41. A method for producing a polypeptide comprising chemically synthesizing the polypeptide of claim 1.